

CBDCs and the Digital Euro

A European Project in the Midst of a Global Momentum

Victor Warhem



© shutterstock

Central bank digital currencies are digital means of payments, which rely on central bank digital issuance and regulation, while nowadays most of digital payments are based on commercial-bank-issued currencies. They erase the credit risk associated with commercial bank digital currencies. **Central bank digital currency projects are gaining momentum in 2022,** (1) as crypto assets increasingly get a widespread recognition, (2) as payment digitalisation has accelerated with the pandemic, and (3) as geopolitical tensions have increased the need for more robust and diversified payment systems.

- ▶ **Regarding retail CBDCs,** central banks from advanced economies first want to preserve the capacity of individuals and businesses to perform safe payments for their everyday life purchases and investments, to increase competition on the retail payments market, as well as to guarantee sovereignty over payment systems. Central banks from emerging economies rather seek to improve financial inclusion and access to safe retail payment systems.
- ▶ **The digital euro project aims at designing a retail CBDC with a full rollout expected in 2025.** The investigation phase has started in July 2021 and will last until September 2023, when the ECB will take a final decision regarding the potential rollout of the solution. Nevertheless, data point out **European consumers are overall satisfied with their retail means of payment** while merchants would only see the interest to accept the digital euro if there is a strong demand for it. Moreover, the Commission's consultation on the digital euro shows **there exists a strong opposition to the project from certain citizens** who are deeply attached to physical cash, although the ECB does not plan any physical cash phasing-out. Hence, this retail CBDC project of the ECB comes at a time when **the European retail payments market is not ready to accept it. It should take for more time than currently assessed to introduce their solution at European scale.**
- ▶ Furthermore, **European regulation surrounding the digital euro project should absolutely avoid crowding out innovation in the private sector related to retail payments, and should instead encourage it:** blockchain-based technologies, purely private retail payments infrastructures, including the peer-to-peer segment of the market, should benefit from a level playing field to blossom in the EU. Interesting technologies have already blossomed in Europe. This comparative advantage must be protected.
- ▶ In the meantime, it may have less trouble participating to **wholesale cross-border CBDCs,** as many central banks are currently working on such projects, **to enhance competition on the cross-border payments market and to ease international capital flows.**

Content

1	Introduction: a Global Momentum for CBDCs	3
2	Retail CBDCs	4
2.1	Dominant Architectures	4
2.1.1	Policy Objectives	4
2.1.2	Operating Models	5
2.1.3	Design Features and Technology	6
2.2	Examples of Retail CBDCs	7
2.3	Assessment	8
2.3.1	Opportunities	8
2.3.2	Risks	9
3	Digital Euro Project	9
3.1	Ignition of the Project and First Sketched Infrastructure	9
3.2	Investigation Phase	10
4	Wholesale Cross-Border CBDCs	13
4.1	Dominant Architectures	13
4.1.1	Policy Objectives	13
4.1.2	Operational Models	13
4.1.3	Design Features and Technology	15
4.2	Examples of Cross-Border Wholesale CBDCs	15
4.3	Assessment	16
4.3.1	Opportunities	16
4.3.2	Risks	16
5	Conclusion	17

Figures

Figure 1:	Motivations for Issuing a Retail CBDC	4
Figure 2:	Share of Adult Population with a Bank Account by Region of the World	5
Figure 3:	Trade-Off Between Dense Regulation or New Functions for Central Banks regarding Retail CBDC Systems	6
Figure 4 :	Overview of the TIPS-Based Two-Tier Model	10
Figure 5:	Digital Euro Project Timeline	12
Figure 6:	Motivations for Issuing a Wholesale CBDC	13
Figure 7:	Multiple-CBDC Arrangement on Multiple Sub-Business Networks	14
Figure 8:	Multiple-CBDC on Multiple Interconnected DLTs	14
Figure 9:	Multiple-CBDC on a Single Multi-Currency System	15

Tables

Table 1:	The Distribution of CBDC Functions Between Central Bank and Private Sector	6
Table 2:	Design Features of CBDC Projects	7
Table 3:	Examples of Retail CBDCs	7
Table 4:	Examples of Cross-Border Wholesale CBDCs	15

1 Introduction: a Global Momentum for CBDCs

Central bank digital currencies (CBDCs) are innovative means of payments, which rely on central bank digital issuance and regulation.¹ After years of research and proofs of concepts on CBDCs² all around the world, **many central banks started to rollout CBDC projects in the last years**. Most notably, the Bank of Bahamas launched the Sand Dollar, a CBDC for retail payments³ that was made available to the public in spring 2021.⁴ The retail CBDC e-Naira was similarly launched in Nigeria in fall 2021.⁵ Finally, a pilot version of the Chinese e-CNY (e-yuan) has already been deployed for almost 300 million Chinese people and their day-to-day payments.⁶ Hence, the Bank for International Settlements (BIS) recently reports that **about 90% of central banks** in its survey (composed of 81 central banks) **confirm researching, testing, or even implementing CBDCs**.⁷ 60% of respondents also confirmed they accelerated their work in CBDCs during the year 2021.⁸

What pushes central banks to accelerate on the topic of CBDCs although first projects started in 2014 (in Uruguay⁹), and then stalled for years? **Central banks mostly react to three phenomena**. Firstly, 2021 was characterized by **a boom in crypto-asset markets**,¹⁰ which central bank worryingly observe as potential competitors for retail payments, especially stable crypto-assets, i.e. stablecoins,¹¹ as well as a source of financial instability.¹² Stablecoins could prove more attractive than legacy retail payments systems, which look in contrast outdated. Besides, 2021 was also the second year of a pandemic which accelerated **the digitalization of economies**, and thus, the digitalization of retail payments, which represented a shift away from central bank currencies (cash, banknotes) to commercial bank¹³ currencies (card payments, transfers, direct debits).¹⁴ This digitalization also questions the possibility of providing central bank currencies to a broader range of financial infrastructures than currently (wholesale payments systems). Finally yet importantly, 2021, and even more 2022, saw **a return of currency geopolitics** with increased tensions between Russia and China – which is currently deploying its own retail CBDC – on one side and liberal democracies on the other side, which could also turn out to modify the international monetary and financial equilibria in favor of certain currencies and enhance the need for resilient and secure international payments systems.¹⁵

There are two major kinds of CBDCs: retail and wholesale CBDCs. Retail CBDCs are typically used for everyday life payments and rely on a payment system that can deal with large amounts of small transaction. In contrast, wholesale CBDCs are used for large-value transactions and must use another clearing and settlement system, which provides a higher degree of transparency to respect “Know-

¹ BIS, [BIS Innovation Hub work on central bank digital currency \(CBDC\)](#), 2021.

² If you want a longer definition of what CBDCs are, please refer to our ceplnput 04.2020 „[The money of tomorrow?](#)“.

³ Retail payments are typically payments between consumers, businesses and public authorities. They can be everyday consumer transactions, but also include, for example, salary and tax payments made by businesses. ECB, [What are retail payments?](#).

⁴ Bloomberg, [How the Tiny Bahamas Beat Global Giants in the E-Currency Race](#), 20.05.2021.

⁵ Central Bank of Nigeria, [President Buhari to Unveil eNaira on Monday](#), 25.10.2021.

⁶ China Briefing, [China Launches Digital Yuan – All You Need to Know](#), 13.04.2022.

⁷ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p.1.

⁸ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 9.

⁹ CBDC Tracker, [e-Peso](#).

¹⁰ Crypto-asset markets are composed of all the different categories of digital assets using blockchain technology for transaction validation and ledger updates, i.e. primarily Bitcoin, Ethereum (native coin of their respective blockchain), and stablecoins (cryptoassets whose value is stable, generally due to a peg to a fiat money like dollar or euro) like Tether. CoinMarketCap, [Total Cryptocurrency Market Cap](#).

¹¹ Please see footnote 10 for more details.

¹² IMF Blog, [Crypto Boom Poses New Challenges to Financial Stability](#), 01.20.2021.

¹³ Commercial banks are private profit-seeking financial establishments. A financial establishment can provide financing (debt/equity/hybrid instruments) and manage savings and investments of individuals and companies.

¹⁴ BIS, [Covid-19 accelerated the digitalisation of payments](#), 09.12.2021.

¹⁵ EEAS, [Post-Pandemic Geopolitics: Together in a world apart](#), 10.07.2021.

Your-Customer” (KYC) requirements.¹⁶ This characteristic is essential due to the transaction values at stake, and due to the small number of participants to the system. This implies different design choices. Also, CBDCs can make different technology choices: centralized/decentralized ledger technology,¹⁷ transaction validation processes, transaction and account data storages, as well as user interfaces. **Technology choices are considered neutral** for the opportunities and risks CBDCs present.¹⁸

In this context, the Centre for European Policy of Paris would like to first precise how central banks are conceiving retail CBDCs for retail payments (Section 2) before focusing on the specific case of the digital euro (Section 3), then detailing the cases of cross-border wholesale CBDCs (Section 4), and finally concluding (Section 5).

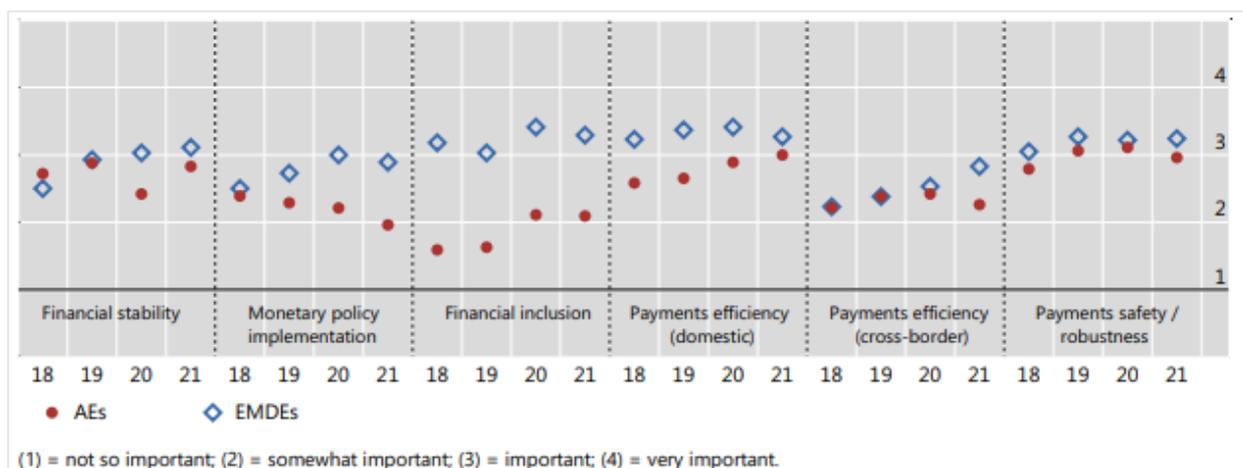
2 Retail CBDCs

2.1 Dominant Architectures

2.1.1 Policy Objectives

Retail CBDC projects show different characteristics given the preoccupations of central banks respectively in advanced and emerging markets.¹⁹ Hence, central banks from advanced economies are mostly motivated by **domestic payments efficiency, safety and robustness** as well as financial stability, while central banks from emerging countries mostly focus on **financial inclusion and access to payments** as driver for retail CBDCs.²⁰

Figure 1: Motivations for Issuing a Retail CBDC



Source: 2021 BIS central bank survey on CBDCs and digital tokens.²¹

¹⁶ IR, [The role of wholesale payments in the global financial landscape](#).

¹⁷ A decentralized ledger technology means the payment system relies on a blockchain and thus a cryptographic transaction validation and ledger update process, which results in inscribing the transaction on every blockchain of the network. A centralized ledger technology means the transaction validation and ledger update only occurs on one ledger, the one of the intermediary through which payments transit. ECB, [Distributed Ledger Technology](#).

¹⁸ Behind the Scenes of Central Bank Digital Currency: Emerging Trends, Insights, and Policy Lessons, Fintech Notes, IMF, p. 25. Please see chapter 2 and 4 for an evaluation of opportunities and risks of retail and wholesale CBDCs.

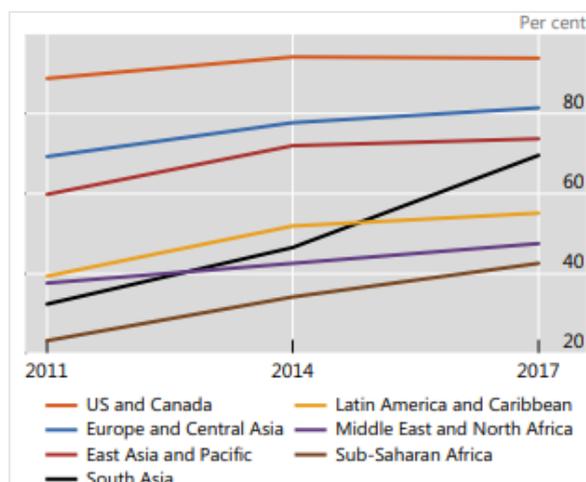
¹⁹ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 7.

²⁰ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 6.

²¹ Ibid.

Emerging countries focus on financial inclusion as first mission of their retail CBDC, as their share of unbanked and offline citizens are higher than in advanced economies (see Figure 2).²²

Figure 2: Share of Adult Population with a Bank Account by Region of the World



Source: World Bank Findex data, Medina and Schneider (2019).²³

2.1.2 Operating Models

Regarding the operating models central banks choose, **a consensus emerges in favor of a two-tier** (intermediated or hybrid²⁴) **model** where the central banks are mostly in charge of dealing with retail CBDC issuance, while the private sector – and first commercial banks – is in charge of the rest (payment processing,²⁵ user interface and onboarding, etc.).²⁶ According to the BIS, more than 70% of central banks engaged in some form of CBDC work are considering a two-tier model.²⁷ The Riksbank with its e-krona project pioneered this model. It rests on a replication of the cash cycle and aims at preserving the existing monetary relationships in the economy.²⁸ Activities where many central banks see **a potential role for the private sector** include, in particular, the **onboarding of clients** (including KYC processes and anti-money laundering/combatting the financing of terrorism – AML/CFT – procedures), **as well as the handling of retail payments**. The recording of retail transactions could also be left to the private sector according to many central banks, although one third would rather keep this activity in-house.

²² BIS Annual Economic Report 2020, [Central banks and payments in the digital era](#), p. 72.

²³ Ibid.

²⁴ An intermediated model of CBDC corresponds to a system in which the central bank does only receive the balance sheet of intermediaries regarding CBDC accounts. Hence, CBDCs transit through a retail system directly managed by intermediaries (mostly commercial banks) and the central bank control money issuance through the reserves held by the intermediaries at the central bank.

An hybrid system corresponds to a system in which commercial banks act as gateway for retail CBDC access for end-consumers (businesses, citizens), but the retail payment system is directly managed by the central bank.

²⁵ Payment processing including payment validation and ledger update.

²⁶ Behind the Scenes of Central Bank Digital Currency: Emerging Trends, Insights, and Policy Lessons, Fintech Notes, IMF, p. 11.

²⁷ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 5.

²⁸ Riksbank, [E-krona](#).

Table 1: The Distribution of CBDC Functions Between Central Bank and Private Sector

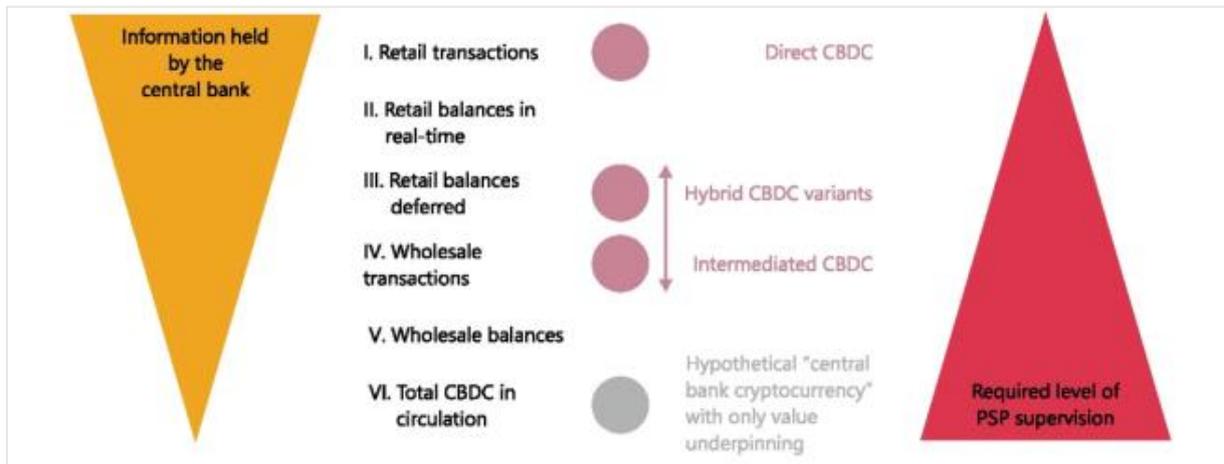
	Issuing		Validation		Ledger Update		KYC-AML/CFT		User Interface		User Data ¹		Customer Service	
	Owner	Executor	Owner	Executor	Owner	Executor	Owner	Executor	Owner	Executor	Owner	Executor	Owner	Executor
Bahamas	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank				
Canada	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank				
China	Central Bank	Central Bank	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both
ECCU	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank	Central Bank				
Sweden	Central Bank	Central Bank	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both	Both
Uruguay	Both	Both	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private	Private

Color scheme: Central Bank Both Private Still Exploring

Source: IMF.²⁹

Other potential models – which have not been rolled out yet – are one-tier models, where the central bank manages everything from retail CBDC issuance to end-user interface, and “hybrid” systems, where there are both CBDC accounts managed by the central bank and an ecosystem of financial establishments, starting with commercial banks.³⁰

Regarding the degree of involvement of the private sector, whatever the central bank chooses, it has a tradeoff to take between increasing supervision over a new payment infrastructure and increasing data processing, storage, management and analysis activities that are traditionally led by the private sector due to their profitability. Every central bank around the world must define its own mix depending on its preferences – i.e. the preferences of their citizens – on the issue.

Figure 3: Trade-Off Between Dense Regulation or New Functions for Central Banks regarding Retail CBDC Systems

Source: Bank for International Settlements.³¹

2.1.3 Design Features and Technology

Regarding design features of retail CBDC projects, the choices made in the implemented setups inform on the probable choices other central banks could be prone to make when foreseeing to rollout their own retail CBDC solution. Hence, **the possibility to let retail CBDCs bear interest has been excluded in the implemented projects** (Sand Dollar in the Bahamas, e-CNY in China or DCash in the Eastern

²⁹ Behind the Scenes of Central Bank Digital Currency: Emerging Trends, Insights, and Policy Lessons, Fintech Notes, IMF, p. 11.

³⁰ Voxeu/CEPR, [CBDC architectures, the financial system, and the central bank of the future](#), 29.10.2020.

³¹ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 5.

Caribbean Currency Union (ECCU)).³² **Quantitative restrictions – i.e. ceilings to spending – for e-wallets**³³ have been set in all the countries implementing their solutions.³⁴ **Differentiated levels of privacy**³⁵ have been introduced – with full anonymity for users desiring to make very small transactions to full transparency for the largest transactions – and quantitative restrictions.³⁶ Finally, some have opted for **offline instruments**, some have not^{37, 38}.

Table 2: Design Features of CBDC Projects

	Carry Interest or Not	Quantitative Restrictions	Anonymity	Offline	Cross-Border Payments
Bahamas	No	Yes	For lower tier	Yes/exploring	Future project
Canada	Undecided	Undecided	Undecided	Exploring	International collaboration
China	No	Yes	For lower tier	Yes	Experimenting/international collaboration
ECCU	No	Yes	For lower tier	No	Future project
Sweden	Undecided	Exploring	Undecided	Exploring	International collaboration
Uruguay	No	Yes	Yes, but traceable	No	Possible future project

Source: IMF.³⁹

2.2 Examples of Retail CBDCs

Table 3: Examples of Retail CBDCs

Retail CBDC	Country	Details
eNaira	Nigeria	The retail CBDC was deployed by the Central Bank of Nigeria in Fall 2021 to improve financial inclusion. As of December 2021, 666 000 wallets had been created, and more than 35 000 transactions (from business to customers and vice-versa) had been executed. E-wallets were downloaded in more than 160 different countries. Payment data and offline payments will be added in the near future as services. ⁴⁰

³² Many economists have pleaded in favor of the use of CBDCs as an instrument to convey innovative monetary policies, among which negative interest rates to encourage consumers and businesses to spend their money. Among other innovative policies, we can mention the possibility to create „CBDC vouchers“, dedicated to be spent for certain goods and services (for instance carbon-neutral ones), or to be spent at certain periods or in certain places. More generally, these innovative policies join the issue of programmability of money that arises with the topic of CBDCs.

³³ E-wallets correspond to digital wallet (for instance an application on a smartphone) on which users can stock their digital currencies.

³⁴ Quantitative restrictions are to be implemented in the context of every retail CBDC systems mainly for three reasons. First, to limit the risk of capital flights to CBDC accounts during bad macroeconomic times, which would jeopardize the business model of commercial banks lacking deposits. Second, to avoid that commercial banks reduce their credit amounts due to lower deposit amounts. Third, to limit the other risks related to national and global financial instability (currency substitution, etc.).

³⁵ Transaction privacy corresponds to a spectrum. The highest level of transaction privacy is anonymity, i.e. the impossibility to identify, the object of transaction, the amount, nor the parties of the transaction ex-post. The next level corresponds to the capacity for the payment service provider and/or the central bank to trace the amount without identifying the parties nor the object of transaction. The lowest level of privacy is full transparency corresponds to the possibility to identify transaction parties via their account, the object of transaction, and the amount.

³⁶ In China, for instance, consumers can benefit from four different levels of privacy: the lowest level allows them to trade in quasi-full anonymity but these trades cannot exceed low amounts. As the trade ceilings increase, the KYC/KYB requirements linearly increase as well for the intermediary (mostly state-controlled commercial banks).

³⁷ Offline instruments are important to be able to make payments when Internet is not available. Nevertheless, these offline instruments still require electricity to function in most cases, which can prevent certain countries where electricity is not widely accessible to adopt retail CBDC systems.

³⁸ Behind the Scenes of Central Bank Digital Currency: Emerging Trends, Insights, and Policy Lessons, Fintech Notes, IMF, p. 15.

³⁹ Ibid.

⁴⁰ PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), p. 16.

Sand Dollar	Bahamas	The digital DLT-based ⁴¹ currency was launched at the beginning of the year 2021, first because of the lack of financial infrastructures on many islands of the Bahamas, but also to enforce anti-money-laundering regulation and shorter payment settlement times. Both an online and offline means of payment were provided (wallets and physical cards). The first financial services surrounding the CBDC have been provided (microloans). The private sector can create further services based on the CBDC infrastructure and data. ⁴²
e-CNY	China	The e-CNY, which has been in development for many years, aims at improving convenience, efficiency, and resilience of the retail payment system. There is also an issue of financial inclusion, even though less vital than for Nigeria and Bahamas. In April 2020, 4 cities were selected as initial pilot locations for the e-yuan rollout. It has been extended to 6 major cities, plus another two that recently hosted the Winter Olympics. About 261 million active wallets and 13,7 bn \$ of transactions were registered, as of January 2022. There were 300k \$ of daily transactions. 11 other cities have been including at the beginning of the year. ⁴³ The digital yuan project has developed four tiers of wallets, with different balance and payments limits installed, depending on the amount of security detail the user has provided. ⁴⁴

Source: own conception.

2.3 Assessment

2.3.1 Opportunities

Retail CBDCs could lead to **an improvement of financial services provided to commercial banks' customers** given the enhanced level of competition for retail deposits: CBDC accounts would capture a share of the current deposits held by commercial banks, although the latter have incentives to limit this transfer, as customer deposits can be used to produce credit. This could also **trigger a downward pressure on financial services' costs**, as commercial banks would need to implement new strategies to keep their deposits, **and encourage lower-cost interconnectivity or interoperability** for CBDCs with retail payment providers and infrastructures, depending on how central banks organize CBDC systems. If payment processing remains public – managed by the central bank – and interoperability with legacy and foreign payment systems is established – which is what central banks are currently working for –, it will be to the benefit of customers. Finally, retail CBDCs also represent the opportunity to start a **brand new payment system**, a so-called “clean slate” which would promote the smooth functioning of retail payments.⁴⁵ For instance, the system could be operable 24/7 in its jurisdiction.

In emerging countries, where the capacity of states to raise taxes is traditionally lower than in advanced countries, retail CBDCs could also **help levy further fiscal resources**, tackle black markets and other illegal activities (money laundering of terrorism financing). This holds even more as cash use decreases in the economy. Retail CBDCs there could also widen financial inclusion – the inclusion of unbanked/offline citizens in the financial system via e-wallets/smartphone applications stocking and

⁴¹ DLT means Distributed Ledger Technology. Distributed ledgers use independent computers (nodes) to record, share and synchronize transactions in the their respective electronic ledgers. World Bank, [Blockchain & Distributed Ledger Technology \(DLT\)](#), 12.04.2018.

⁴² PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), p. 17.

⁴³ Coin Geek, [China's digital yuan wallet launches on app stores for 11 select cities](#), 06.01.2022.

⁴⁴ PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), p. 18.

⁴⁵ BIS, [Central bank digital currencies: motives, economic implications and the research frontier](#), 10.2021, p. 21.

using retail CBDCs or physical cards containing CBDC units – by providing new safe means of payments to unbanked populations.

Finally, retail CBDCs could **improve monetary policy transmission and effectiveness** if central banks let themselves have the power to deposit units directly on citizens' and business' accounts instead of using intermediaries' lending activity as main channel.

2.3.2 Risks

However, retail CBDCs could also **crowd out deposits from commercial bank accounts and thus lower their level of credit**, which could have an upward effect on interest rates. There would also be a **heightened risk of bank-run⁴⁶ in periods of financial instability** if CBDC amounts are not sufficiently limited and prevent commercial banks from benefiting from stable deposit levels. Moreover, retail CBDC systems may require **heavy investments in cybersecurity and system resilience** to avoid any breach in the confidence of citizens.

The argument in favor of financial inclusion to promote CBDCs could in certain contexts also achieve the exact contrary and lead to **financial exclusion** where the underlying needs to let the CBDC solution operate are not there. For instance, in Ghana, only 80% of the population has a stable access to electricity and a bit more of 40% a stable access to the Internet.⁴⁷

The lack of total anonymity – a feature physical cash is the only one to provide – could also deter consumers from adopting the solution. The level of privacy has to be conformed to people's expectations, which, for instance in the case of the EU, is not an easy thing as preferences in retail payments are mostly national. For instance, the German population is deeply attached to physical cash while only less than 10% of Swedes still with cash today.⁴⁸

To see how a retail CBDC project can unfold, the next section will be dedicated to describing the project of digital euro.

3 Digital Euro Project

3.1 Ignition of the Project and First Sketched Infrastructure

In September 2020, the Eurosystem's high-level task force on Central Bank Digital Currency launched experiments on a digital euro, to gain knowledge on its feasibility.⁴⁹ The first work-stream focused on **a network architecture built on the existing European public market infrastructure service TARGET Instant Payment Settlement (TIPS) system.**⁵⁰ The experiments of the second work-stream focused on how to combine centralized transaction validation and ledger update technology with distributed

⁴⁶ A bank run corresponds to the moment when customers of a bank rush in simultaneously to withdraw their deposits by fear of losing them due to the bank's insolvency.

⁴⁷ Giesecke+Devrient, [Bank of Ghana partners with G+D to pilot first general purpose Central Bank Digital Currency in Africa](#), 11.08.2021.

⁴⁸ Riksbank, [Cash is losing ground](#), 29.10.2020.

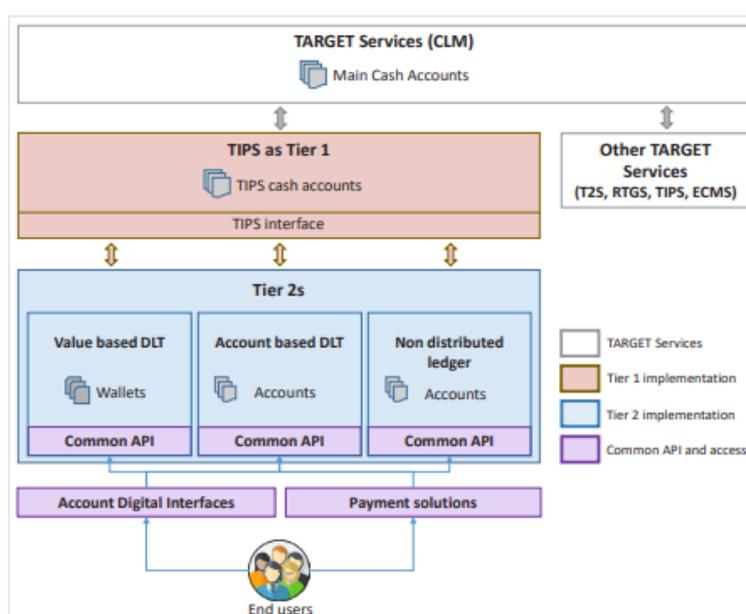
⁴⁹ Banque de France, [Digital Euro Experiment Combined Feasibility – Tiered Model](#), 07.2021, p. 1.

⁵⁰ TARGET Instant Payment Settlement (TIPS) is a market infrastructure service launched by the Eurosystem in November 2018. It enables payment service providers to offer fund transfers to their customers in real time and around the clock, every day of the year. This means that thanks to TIPS, individuals and firms can transfer money between each other within seconds, irrespective of the opening hours of their local bank. ECB, [What is TARGET Instant Payment Settlement \(TIPS\)?](#).

platform(s) based on DLT. In October 2020, the ECB released in parallel a long study on the possible architectures of the digital euro.⁵¹

The sketched TIPS-based two-tier infrastructure displays an ECB/Eurosystem retail CBDC issuance and a distribution through intermediaries (mostly commercial banks) provides them to customers. **The second tier is made of multiple coexisting and interoperable systems** where all supervised intermediaries open and manage accounts or tokenized wallets for end-users.⁵² This model was thought to preserve **a right balance between public and private actors**,⁵³ and build upon the central role of financial intermediaries in the economy. It is fully interoperable with private sector front-end solutions.⁵⁴ Its architecture is adaptable to future innovations. Regarding technology, **it includes both distributed-ledger technology (DLT) and non-DLT**. Transaction and account data is accessible to intermediaries via common Application Programming Interfaces (API).

Figure 4 : Overview of the TIPS-Based Two-Tier Model



Source: Banque de France.⁵⁵

This system was tested and assessed to be functioning by the Banque de France.⁵⁶ However, the final system – if there is any – might not be designed as such.

3.2 Investigation Phase

The investigation phase of the project officially started in July 2021 and foresaw a pilot phase until the end of 2023.⁵⁷ During this investigation phase, the Eurosystem's High-Level Task Force for CBDCs (HLTF-CBDC) first created a Market Advisory Group (MAG) – a group of 30 experts in the retail payments industry – whose job is to better grasp the trends on the European retail payments market,

⁵¹ ECB, [Report on a digital euro](#), 10.2020.

⁵² Banque de France, [Digital Euro Experiment Combined Feasibility – Tiered Model](#), 07.2021, p. 10.

⁵³ Considering Table 1, the proposed digital euro infrastructure would resemble the situation in the Bahamas, with the Sand Dollar.

⁵⁴ Regarding front-end solutions, the ECB has launched a digital euro front-end prototyping exercise last April. ECB, [Join the digital euro front-end prototyping exercise](#), 28.04.2022.

⁵⁵ Banque de France, [Digital Euro experiment combined feasibility – tiered model](#), 07.2021.

⁵⁶ Ibid.

⁵⁷ ECB, [Key milestones of the digital euro project](#), p. 2.

as much on the consumer as on the merchant sides. The European Retail Payments Board⁵⁸ is also assisting the HLTF-CBDC in its process towards designing the digital euro.

Regarding **use case prioritization**,⁵⁹ the Market Advisory Group has already identified four of them, depending on their affiliation to public policy objectives and the importance of their market segment in terms of transactions. They are, by increasing order of importance: **government payments (transfers and taxes), peer-to-peer payments, physical store payments, and e-commerce payments**. Two criteria were examined to order the use cases: the size of the concerned market segment and the importance of the targeted policy objective for public authorities.⁶⁰

In parallel to the MAG process, an ECB-commissioned Kantar Public study has been published on the digital payment habits of consumers and merchants in the EU.⁶¹ In this study, it can be noted that **most European consumers are satisfied with their retail means of payment**⁶² and that **merchants would only be ready to accept a retail digital euro if there was a widespread adoption among consumers**.⁶³ However, most of consumers were initially not aware of the digital euro project, and understood its potential advantage compared to commercial bank currencies once they were taught on the topic.⁶⁴

Until the experimentation phases (with a possible series of pilots) possibly starts from September 2023 on, the ECB project needs to move forward to further explore online and offline tools for a potential CBDC solution, the different privacy levels of such a solution, and of the right balance to strike for adoption and acceptance. At the end of 2022, the role of private intermediaries will be precised, as well as the payment validation and ledger update model, and a prototype for CBDC distribution will be developed.⁶⁵ The first semester of 2023 will be dedicated to defining access to the CBDC ecosystem.

⁵⁸ ECB, [Euro Retail Payments Board](#).

⁵⁹ Market Advisory Group, [Digital euro – use case analysis](#), 04.05.2022.

⁶⁰ ECB, [Digital euro – use case analysis](#), 04.05.2022, p. 9.

⁶¹ Kantar Public, [Study on New Digital Payment Methods](#), 03.2022.

⁶² Kantar Public, [Study on New Digital Payment Methods](#), 03.2022, p. 8.

⁶³ Kantar Public, [Study on New Digital Payment Methods](#), 03.2022, p. 9.

⁶⁴ Kantar Public, [Study on New Digital Payment Methods](#), 03.2022, p. 8.

⁶⁵ A tender has been launched to select private companies which will design end-user interface prototypes. ECB, [Join the digital euro front-end prototyping exercise](#), 28.04.2022.

Figure 5: Digital Euro Project Timeline



Source: ECB.⁶⁶

Beyond the ECB process, the European Commission has conducted a public consultation to better identify the expectation of citizens and businesses for a digital euro. The consultation closed on June 16 and ended up emphasizing **the strong wish of European citizens to strongly preserve privacy with the new instruments.**⁶⁷ A lot of them feared the introduction of a CBDC would correspond to the phasing-out of physical cash, which is not at the agenda of the ECB.⁶⁸

Hence, this retail CBDC project of the ECB comes at a time when the European retail payments market is not ready to accept it. **The ECB should take for more time than currently assessed to introduce their solution at European scale.** In contrast, there is a will to move forwards quite rapidly in advanced countries, but essentially on the cross-border wholesale segment of market, i.e. the cross-border market of high-level transactions between financial establishments.⁶⁹ The next section details how it works.

Furthermore, **European regulation surrounding the digital euro project should absolutely avoid crowding out innovation in the private sector related to retail payments, and should instead encourage it:** blockchain-based technologies, purely private retail payments infrastructures, including the peer-to-peer segment of the market, should benefit from a level playing field to blossom in the EU. Interesting technologies have already blossomed in Europe.⁷⁰ This comparative advantage must be protected.

⁶⁶ ECB, [Key milestones of the digital euro project](#), p. 2.

⁶⁷ European Commission, [Targeted consultation on a digital euro](#).

⁶⁸ ECB, [The digital euro and the evolution of the financial system](#), 15.06.2022.

⁶⁹ Financial Times, [CBDCs now hold wholesale appeal for central bankers](#), 02.06.2022.

⁷⁰ We can count among blockchain-based CBDC solutions for retail [LiquidShare](#) or [NEAR](#).

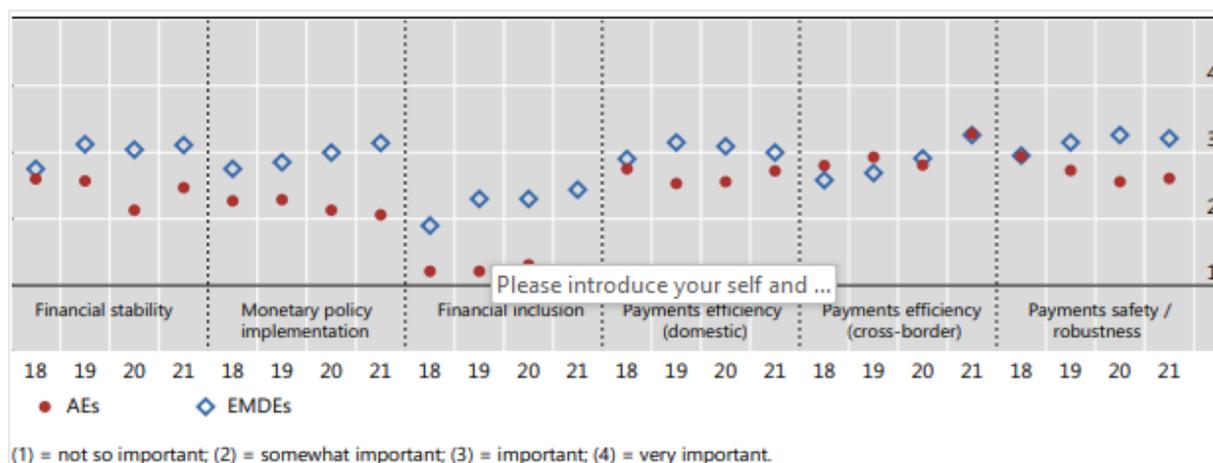
4 Wholesale Cross-Border CBDCs

4.1 Dominant Architectures

4.1.1 Policy Objectives

Cross-border wholesale CBDCs have the objective to ease cross-border high-amount transactions between financial establishments, as this market is historically not efficient. Until now, commercial banks were the main actors of the cross-border payments market, with few competition due to high barriers to entry (differences in legal, economic and cultural setups), to the detriment of service and price for the consumers.⁷¹ In contrast with retail CBDCs, **both advanced and emerging economies' central banks tend to quote cross-border payments efficiency as main driver for research and implementation.**⁷²

Figure 6: Motivations for Issuing a Wholesale CBDC



Source: 2021 BIS central bank survey on CBDCs and digital tokens.⁷³

4.1.2 Operational Models

There are three different cases of architecture for cross-border wholesale CBDC systems. The first system relies on **compatible CBDCs**, i.e. on CBDCs, **which share their messaging system** (like SWIFT⁷⁴ nowadays), creating network compatibility due to shared messaging standards.⁷⁵ This messaging system could for instance be state-of-the-art in including distributed ledger technology (see Figure 9) to improve transparency and efficiency. For the rest, compatible cross-border wholesale CBDC systems can have their own clearing and settlement systems, their own rulebook, governance and ecosystem. This is the lowest degree of integration of CBDC systems. This system has the advantage to be **the easiest to implement**. Nevertheless, it would not ease cross-border flows as much as other types of systems.

⁷¹ BIS, [Improving access to payment systems for cross-border payments: best practices for self-assessments](#), 05.2022, p. 13.

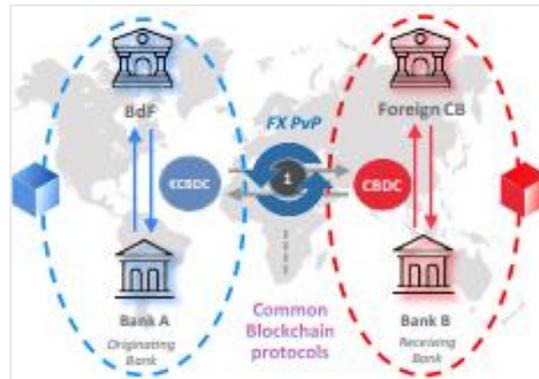
⁷² BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 7.

⁷³ BIS Paper, [Gaining momentum – Results of the 2021 BIS survey on central bank digital currencies](#), 05.2022, p. 7.

⁷⁴ SWIFT, [About Us](#).

⁷⁵ SWIFT, [About us](#).

Figure 7: Multiple-CBDC Arrangement on Multiple Sub-Business Networks

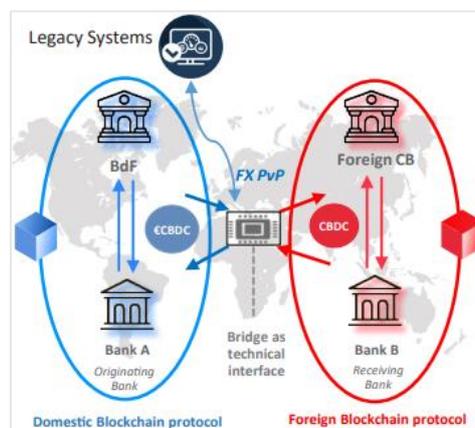


Source: Banque de France.⁷⁶

In the second setup, **interconnected CBDC systems** do not share the same messaging system, nor rulebook, governance, clearing and settlement systems but **can interoperate through an ad-hoc cross-border wholesale payment system**, which would be built and governed internationally (maybe designed by the Bank for International Settlements).

This option is hardly viable as it is unlikely every country could agree on a satisfying governance framework for the new infrastructure. The coordination costs are tremendous, even with the leadership of the BIS. A progressive integration of central and commercial banks in the system remain possible.

Figure 8: Multiple-CBDC on Multiple Interconnected DLTs



Source: Banque de France.⁷⁷

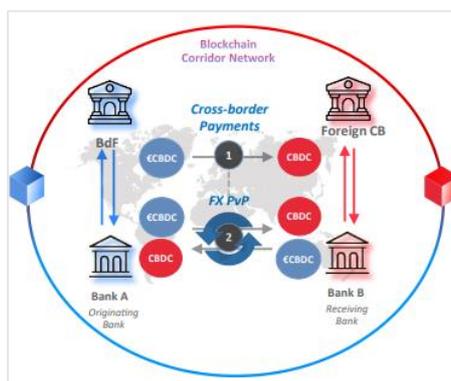
Finally, a third system, where multiple CBDCs share the same rulebook, governance, clearing and settlement mechanisms and a single set of participants can also be established. This system is „**CBDC corridor**“ is currently experimented with the multiple-CBDC Bridge project, conducted by China, Hong-Kong, Thailand and the United Arab Emirates.⁷⁸ This ambitious CBDC system would tremendously ease the cross-border flows of CBDCs but show even stronger governance challenges to overcome before succeeding in uniting most central banks.

⁷⁶ Banque de France, [Wholesale Central Bank Digital Currency Experiments with the Banque de France](#), 11.2021, p. 13.

⁷⁷ Banque de France, [Wholesale Central Bank Digital Currency Experiments with the Banque de France](#), 11.2021, P. 14.

⁷⁸ BIS, [Central banks of China and United Arab Emirates join digital currency project for cross-border payments](#), 23.02.2021.

Figure 9: Multiple-CBDC on a Single Multi-Currency System



Source: Banque de France.⁷⁹

4.1.3 Design Features and Technology

Central banks participating to cross-border projects – among which the ones listed in 4.2 – want to improve previous existing clearing and settlement systems, which involves the use of a new technology to enhance efficiency of the systems. Design choices usually also focus on **interoperability** of the new system with legacy systems. **Programmability** – the capacity to design smart contract, which delivers payments under certain conditions – might also be a key feature to enable delivery-versus-payment (DvP) or payment-versus-payment (PvP) interbank payments and securities transactions.

4.2 Examples of Cross-Border Wholesale CBDCs

Table 4: Examples of Cross-Border Wholesale CBDCs

Wholesale CBDC	Details
mCBDC Bridge project	This project is the most ambitious and regroups the Bank of China, the Bank of Thailand, the Bank of the United Arab Emirates, and the Hong Kong Monetary Authority to create a CBDC “corridor” – i.e. a common system with common rules and metrics to ease cross-border flows of capital. The Bank for International Settlements also participates to the project. In September 2021, they released a report on phase 2, which sought to create a multiple-CBDC arrangement for a faster, cheaper, and more efficient mechanism for transfers and foreign exchange operations. ⁸⁰ The prototype demonstrates a substantial increase in cross-border transfer speed from days to seconds, as well as the potential to reduce several of the core cost components of correspondent banking. ⁸¹
Project Dunbar	The central banks of Australia, Singapore, Malaysia, and South Africa, in collaboration with the BIS, began exploring a platform for international settlements through this project. As of March 2022, the project was successful in building two prototypes to allow international settlements across multiple CBDCs. The goal of this project is to let commercial banks exchange funds without the need of further intermediaries. ⁸²
Project Aber	The United Arab Emirates and Saudi Arabia launched a bilateral CBDC pilot project in 2019 and concluded that decentralized ledger can successfully facilitate cross-border transactions. ⁸³

Source: own conception.

⁷⁹ Banque de France, [Wholesale Central Bank Digital Currency Experiments with the Banque de France](#), 11.2021, P. 14.

⁸⁰ Atlantic Council, [Central Bank Digital Currency Tracker](#).

⁸¹ PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), 04.04.2022, p. 29.

⁸² PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), 04.04.2022, p. 30.

⁸³ PwC, [PwC Global CBDC Index and Stablecoin Overview 2022](#), 04.04.2022, p. 36.

4.3 Assessment⁸⁴

4.3.1 Opportunities

One major advantage of cross-border wholesale CBDCs relative to retail CBDCs is **that it could probably be implemented more rapidly** as it involves less stakeholders than retail CBDC programs, and enable central banks to focus on competencies they have already developed, such as transaction settlement, rather than a full suite of retail CBDC components and requirements.

Besides, the cross-border use of wholesale CBDCs could improve **the smoothness of the cross-border payments market**, which still suffers from large frictions along many corridors, by providing strong interoperability – either with compatible, interconnected or unique cross-border wholesale CBDC systems. Furthermore, cross-border payments are currently suffering from transaction delays, as well as high costs due to the involvement of a high number of intermediaries across different time zones along the correspondent banking process. **Cross-border wholesale CBDCs represent an opportunity to reduce complexity, fragmentation and concentration on the cross-border payments market**, with a parallel building of a global levelled playing field on this market if the system lets payments service providers furnish their services to financial establishments. **The cross-border payments market also suffers from low traceability and lack of transparency** (difficulty to implement AML/CFT checks), **which could be improved with a new cross-border wholesale CBDC system**. Given the high level of wholesale transaction amounts, sharing a common messaging system, a bridge system, or a unique set of rules and system, will tremendously improve the transparency and the traceability of international wholesale transactions.

Finally, cross-border wholesale systems could provide an additional means to settle transactions internationally, coupled with developing open, competitive and compatible domestic payment systems. We also would expect increases in cross-border flows, risk sharing and GDP growth.

4.3.2 Risks

Due to the enhanced rapidity and smoothness of cross-border payments, **a seamless cross-border CBDC experience could intensify contagion phenomena, with even quicker capital outflows**, leaving certain economies dry in crisis periods. Hence, cross-border wholesale CBDC systems must be carefully designed to incorporate capital flow management measures. Otherwise, countries might lose their capital quickly, with dramatic effects on the value of the currency. Programmability, if correctly leveraged, could become a new tool to implement innovative capital flow management measures.

Currency substitution – i.e. the use of a foreign CBDC for domestic payments – could also intensify with a wider availability of foreign currencies via an easily accessible CBDC platform, which would be managed by financial establishments. Widespread currency substitution would undermine monetary policy independence, as local central banks could not rely on their own currency as transmission instrument, and involve risks for both the issuing and receiving countries. The “global imbalance”, where the US Fed is issuing dollars for the international demand, sustaining large public and trade deficits, could be reproduced in other countries.

⁸⁴ Inspired by BIS, [Central bank digital currencies for cross-border payments, Report to the G20](#), Chapter 3, 07.2021.

Shifts in foreign demand due to a high degree of currency substitution could also mean large and uncontrollable movements in capital flows. The central bank would less control the liquidities that flow into its economy. It would also reduce the stability of money demand. **Currency substitution can also undermine the ability of the domestic central bank to carry out the lender of last resort function.** This would force central banks to intensify their liquidity swaps with other central banks to provide the right currencies to bailout their own financial system. In return, there could also be an increased risk of bank runs, due to the easy availability of foreign currencies. For this case again, capital flow management measures should be implemented, such as limits on non-resident holdings, requisite onboarding protocols for users and merchants, tactical pricing mechanisms (for instance fees on very large or frequent cross-border transactions) to limit cross-border use.

5 Conclusion

The world is experiencing a vast surge in interest for retail and cross-border wholesale CBDC projects. Retail CBDC projects are starting to be rolled out, especially in emerging countries but almost every central bank is working on them, at least at the research stage. It happens first because of the interest of the public for possibly competing private crypto assets, but because of the increasing use of digital means of payments, and finally also because of a return of currency geopolitics. Not all these projects will lead to a CBDC, either retail or wholesale, in the next years – starting with the digital euro, upon which not everybody agrees. Advanced economies might finally delay their retail CBDC projects indefinitely as the crypto-asset sector dramatically shrinks, or because digital retail means of payments are assessed to be sufficiently safe, efficient and ubiquitous. Nevertheless, they also might be compelled to rollout their solution to fight a possible currency substitution with powers that may roll it out before them, like China with its e-CNY.

Moreover, it can be expected that emerging countries' central banks may have more incentives in the middle term to roll out retail CBDC solutions to tackle a lack of financial inclusion and less safe, ubiquitous and efficient retail means of payment. Regarding wholesale cross-border projects, geopolitics might play a large role to shape the future landscape of interoperable international wholesale CBDC solutions.

Nevertheless, it is fair to expect a dramatic change of the international financial and monetary system in the coming years due to the implementation of CBDC projects.

**Author:**

Victor Warhem, Economist, cep Paris
warhem@cep.eu

Centre de Politique Européenne PARIS

15 Boulevard Henri IV | F-7504 Paris
Tel. + 33 9 87 35 73 36

The **Centrum für Europäische Politik** FREIBURG | BERLIN, the **Centre de Politique Européenne** PARIS, and the **Centro Politiche Europee** ROMA form the **Centres for European Policy Network** FREIBURG | BERLIN | PARIS | ROMA.

Free of vested interests and party-politically neutral, the Centres for European Policy Network provides analysis and evaluation of European Union policy, aimed at supporting European integration and upholding the principles of a free-market economic system.